

*Amendments to the Claims*

This listing of claims will replace all prior versions and listings of claims in the above-identified application.

1. (Currently amended) A method comprising:

identifying a plurality of nodes with resources, wherein said nodes with resources are comprised in an optical network and have a resource necessary to support a virtual path, wherein said identifying said plurality of nodes with resources comprises

in response to detecting a failure in said virtual path, forwarding a resource request to an adjacent node,

waiting for a predefined time for a response to said resource request,

if said response to said resource request is not received within said predefined time, initiating a subsequent failure measure, wherein

said initiating a subsequent failure measure comprises generating a network alarm, and

receiving, from a candidate node, information indicating that said candidate node has sufficient resources available to support said virtual path, wherein said candidate node is configured to determine whether said candidate node has sufficient resources available to support said virtual path; and [[, and]]

~~said information is transmitted from said candidate node along a first physical path;~~

identifying, based at least in part on said identifying said plurality of nodes with resources, said first physical path as an alternate physical path ~~for said virtual path~~, said alternate physical path comprising ones of said nodes with resources.

2. (Currently amended) The method of claim 1, ~~further~~ comprising:  
restoring said virtual path using said alternate physical path.
3. (Previously presented) The method of claim 2, wherein said restoring is done by  
configuring said alternate physical path by establishing a communication connection  
between said ones of said nodes with resources; and  
provisioning said virtual path over said alternate physical path.
4. (Currently amended) The method of claim 2, ~~further~~ comprising:  
detecting ~~[[a]]~~ said failure in said virtual path; wherein  
said detection of said failure is done by receiving a failure message ~~packet~~;  
said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;  
said optical network comprises nodes, and said nodes comprise said nodes with  
resources;  
each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;  
said physical path between said first and said second node comprises a plurality of  
intermediate nodes; and  
each one of said nodes is coupled to at least one other of said nodes in a mesh topology.
5. (Original) The method of claim 4, wherein said restoring of said virtual path is  
completed in less than 2 seconds.
6. (Original) The method of claim 4, wherein said restoring of said virtual path is  
completed in less than 250 milliseconds.

7. **(Currently amended)** The method of claim 4, wherein said first node receives said failure message **packet**.
8. **(Currently amended)** The method of claim 7, ~~further~~ comprising:
- (i) changing a state of said virtual path to restoring;
  - (ii) identifying an adjacent node with required bandwidth for said virtual path;
  - (iii) forwarding a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) waiting for a resource response packet for a predetermined time interval; and
- if said resource response packet is not received within said predetermined time interval, repeating steps (ii) – (iv) for a predefined threshold time.
9. **(Currently amended)** The method of claim 8, ~~further~~ comprising:
- if said resource response packet is not received within said predefined threshold time, generating a network alarm.
10. **(Currently amended)** The method of claim 8, ~~further~~ comprising:
- if said resource response packet is received with at least one error,
- waiting until responses to all resource request packets are received; and
- if said resource response packet is received with no errors,
- determining if a list of allocated ports in said resource response packet is valid.
11. **(Currently amended)** The method of claim 10, ~~further~~ comprising:
- if said list of allocated port is valid,
- provisioning said virtual path on said allocated ports; and
- if said list of allocated ports is invalid,

generating a network alarm.

12.    **(Currently amended)** The method of claim 10, ~~further~~ comprising:  
  
          if responses to all resource request packets are received with at least one error,  
  
          generating a network alarm.
  
13.    (Previously presented) The method of claim 9, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.
  
14.    (Original) The method of claim 4, wherein one of said intermediate nodes receives said failure message.
  
15.    **(Currently amended)** The method of claim 14, ~~further~~ comprising:  
  
          changing a state of said virtual path to down;  
  
          forwarding said failure message to adjacent nodes comprising said virtual path;  
  
          initiating a timer for receiving a response to said forwarded failure message;  
  
          if said timer expires before said response to said forwarded failure message is received,  
  
              releasing resources of said virtual path; and  
  
          if said response to said forwarded failure message is received before said timer expires,  
  
              stopping said timer, and  
  
              releasing resources of said virtual path.
  
16.    (Original) The method of claim 4, wherein said second node receives said failure message.
  
17.    **(Currently amended)** The method of claim 16, ~~further~~ comprising:  
  
          acknowledging said failure message;

changing a state of said virtual path to down; and  
releasing resources of said virtual path.

18. (Previously presented) The method of claim 8, wherein one of said intermediate nodes receives said resource request packet.

19. (**Currently amended**) The method of claim 18, ~~further~~ comprising:

if said resource request packet includes at least one error,

copying said resource request packet to a first resource response packet,

decrementing a hop count field in said first resource response packet,

adding an error code to said first resource response packet, and

responding with said first resource response packet; and

if said resource request packet includes no errors,

allocating a resource to said virtual path,

incrementing a hop count field in said resource request packet,

forwarding said resource request packet to an adjacent node having a resource  
necessary to support said virtual path, and

waiting for a second resource response packet from said adjacent node.

20. (**Currently amended**) The method of claim 19, ~~further~~ comprising:

if said second resource response packet is not received within a second predetermined  
time interval,

releasing said resource allocated to said virtual path, and

forwarding a negative acknowledgment to said first node.

21. **(Currently amended)** The method of claim 19, ~~further~~ comprising:
- if said second resource response packet is received with at least one error,
    - releasing said resource allocated to said virtual path,
    - decrementing a hop count field in said second resource response packet, and
    - forwarding said second resource response packet to said first node; and
  - if said second resource response packet is received with no errors,
    - determining if said second resource response packet includes a valid list of a plurality of ports.
22. **(Currently amended)** The method of claim 21, ~~further~~ comprising:
- if said list of said plurality of ports is invalid,
    - releasing resources allocated to said virtual path, and
    - forwarding a negative acknowledgement to said first node;
  - if said list of said plurality of ports is valid,
    - determining if said plurality of ports is available;
  - if said plurality of ports is available,
    - assigning said plurality of ports to said virtual path, and
    - updating said virtual path information in a node database;
  - if said plurality of ports is not available,
    - adding an error code to said second resource response packet;
  - decrementing a hop count field in said second resource response packet; and
  - forwarding said second resource response packet to said first node.

23. **(Currently amended)** The method of claim 18, ~~further~~ comprising:  
if a state of said virtual path is one of 'restoring' and 'deleting',  
    copying said resource request packet to said first resource response packet,  
    decrementing said hop count field in said first resource response packet,  
    adding an error code of to said first resource response packet, and  
    responding with said first resource response packet.
24. (Original) The method of claim 8, wherein said second node receives said resource request packet.
25. **(Currently amended)** The method of claim 24, ~~further~~ comprising:  
if said resource request packet includes invalid information,  
    copying said resource request packet to a third resource response packet,  
    decrementing a hop count field in said third resource response packet,  
    adding an error code to said third resource response packet, and  
    responding with said third resource response packet; and  
if said resource request packet includes valid information,  
    determining if a resource is available for said virtual path.
26. **(Currently amended)** The method of claim 25, ~~further~~ comprising:  
if said resource is available for said virtual path,  
    copying said resource request packet to said third resource response packet,  
    allocating said resource to said virtual path,  
    updating said virtual path information in a node database,  
    decrementing a hop count field in said third resource response packet,

adding a list of a plurality of ports to said third resource response packet, and  
responding with said third resource response packet.

27. **(Currently amended)** The method of claim 25, ~~further~~ comprising:

if said resource is not available for said virtual path,

copying said resource request packet to said third resource response packet,  
decrementing said hop count field in said third resource response packet,  
adding an error code to said third resource response packet, and  
responding with said third resource response packet.

28. **(Currently amended)** The method of claim 24, ~~further~~ comprising:

if a state of said virtual path is one of 'restoring' and 'deleting',

copying said resource request packet to said third resource response packet,  
decrementing said hop count field in said third resource response packet,  
adding an error code to said third resource response packet, and  
responding with said third resource response packet.

29. **(Currently amended)** A network element comprising:
- a processor configured to restore a virtual path in an optical network;
  - a memory coupled to said processor; and
  - a network interface coupled to said processor; wherein
- said processor is configured to
- receive, from a candidate node, an indication that said candidate node has sufficient resources available to support said virtual path, and
  - identify, based at least in part on said received indication, a plurality of nodes with resources,
- said candidate node is configured to, in response to detecting a failure in said virtual path, forward a resource request to an adjacent node,**
- said candidate node is configured to wait for a predefined time for a response to said resource request,**
- said candidate node is configured to, if said response to said resource request is not received within said predefined time, initiate a subsequent failure measure, wherein**
- said subsequent failure measure comprises a network alarm,**
- said candidate node is configured to determine whether said candidate node has said sufficient resources available to support said virtual path,
- said nodes with resources are comprised in said optical network and have a resource necessary to support said virtual path, ~~said indication is transmitted from said candidate node along a first physical path;~~ and
- said processor is ~~further~~ configured to identify, **based at least in part on identifying said plurality of nodes with resources, said first physical path as** an alternate physical path ~~for said virtual path,~~ said alternate physical path comprising ones of said nodes with resources.

30. **(Currently amended)** The network element of claim 29, wherein said processor is **further** configured to

restore said virtual path using said alternate physical path.

31. **(Currently amended)** The network element of claim 29, wherein said processor is **further** configured to

configure said alternate physical path by establishing a communication connection between said ones of said nodes with resources; and provision said virtual path over said alternate physical path.

32. **(Currently amended)** The network element of claim 29, wherein said processor is **further** configured to

detect **[[a]]** **said** failure in said virtual path; wherein said detection of said failure is done by receiving a failure message **packet**; said virtual path is provisioned on a physical path between a first and a second node of said optical network; said optical network comprises nodes, and said nodes comprise said nodes with resources; each one of said nodes is coupled to at least one other of said nodes by a plurality of optical links; said physical path between said first and said second node comprises a plurality of intermediate nodes; and each one of said nodes is coupled to at least one other of said nodes in a mesh topology.

33. **(Currently amended)** The network element of claim 32, wherein said processor is **further** configured to restore said virtual path in less than 2 seconds.

34. **(Currently amended)** The network element of claim 32, wherein said processor is **further** configured to restore said virtual path in less than 250 milliseconds.
35. **(Currently amended)** The network element of claim 32, wherein  
said network element is configured as said first node; and  
said network element is configured to receive said failure message **packet**.
36. **(Currently amended)** The network element of claim 35, wherein said processor is **further** configured to
- (i) change a state of said virtual path to restoring;
  - (ii) identify an adjacent node with required bandwidth for said virtual path;
  - (iii) forward a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) wait for a resource response packet for a predetermined time interval; and
  - (v) if said resource response packet is not received within said predetermined time interval, repeat steps (ii) – (iv) for a predefined threshold time.
37. **(Currently amended)** The network element of claim 36, wherein said processor is **further** configured to
- if said resource response packet is not received within said predefined threshold time,  
generate a network alarm.
38. **(Currently amended)** The network element of claim 36, wherein said processor is **further** configured to
- if said resource response packet is received with at least one error,  
wait until responses to all resource request packets are received; and  
if said resource response packet is received with no errors,

determine if a list of allocated ports in said resource response packet is valid.

39. **(Currently amended)** The network element of claim 38, wherein said processor is **further** configured to

if said list of allocated port is valid,

provision said virtual path on said allocated ports; and

if said list of allocated ports is invalid,

generate a network alarm.

40. **(Currently amended)** The network element of claim 38, wherein said processor is **further** configured to

if responses to all resource request packets are received with at least one error,

generate a network alarm.

41. **(Previously presented)** The network element of claim 39, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.

42. **(Currently amended)** The network element of claim 32, wherein

said network element is configured as one of said intermediate nodes, and

said network element is configured to receive said failure message **packet**.

43. **(Currently amended)** The network element of claim 42, wherein said processor is **further** configured to

change a state of said virtual path to down;

forward said failure message to adjacent nodes comprising said virtual path;

initiate a timer for receiving a response to said forwarded failure message;

if said timer expires before said response to said forwarded failure message is received,

- release resources of said virtual path; and
  - if said response to said forwarded failure message is received before said timer expires,
  - stop said timer, and
  - release resources of said virtual path.
44. (Previously presented) The network element of claim 32, wherein
- said network element is configured as said second node, and
- said network element receives said failure message.
45. **(Currently amended)** The network element of claim 44, wherein said processor is **further** configured to
- acknowledge said failure message;
  - change a state of said virtual path to down; and
  - release resources of said virtual path.
46. (Original) The network element of claim 36, wherein
- said network element is configured as one of said intermediate nodes, and
- said network element receives said resource request packet.
47. **(Currently amended)** The network element of claim 46, wherein said processor is **further** configured to
- if said resource request packet includes at least one error,
  - copy said resource request packet to a first resource response packet,
  - decrement a hop count field in said first resource response packet,
  - add an error code to said first resource response packet, and
  - respond with said first resource response packet; and

if said resource request packet includes no errors,  
allocate a resource to said virtual path,  
increment a hop count field in said resource request packet,  
forward said resource request packet to an adjacent node having a resource  
necessary to support said virtual path, and  
wait for a second resource response packet from said adjacent node.

48. **(Currently amended)** The network element of claim 47, wherein said processor is **further** configured to

if said second resource response packet is not received within a second predetermined  
time interval,  
release said resource allocated to said virtual path, and  
forward a negative acknowledgment to said first node.

49. **(Currently amended)** The network element of claim 47, wherein said processor is **further** configured to

if said second resource response packet is received with at least one error,  
release said resources allocated to said virtual path,  
decrement a hop count field in said second resource response packet, and  
forward said second resource response packet to said first node; and  
if said second resource response packet is received with no errors,  
determine if said second resource response packet includes a valid list of a  
plurality of ports.

50. **(Currently amended)** The network element of claim 49, wherein said processor is **further** configured to

if said list of said plurality of ports is invalid,

release resources allocated to said virtual path, and  
forward a negative acknowledgement to said first node;  
if said list of said plurality of ports is valid,  
determine if said plurality of ports is available;  
if said plurality of ports is available,  
assign said plurality of ports to said virtual path, and  
update said virtual path information in a node database;  
if said plurality of ports is not available,  
add an error code to said second resource response packet;  
decrement a hop count field in said second resource response packet; and  
forward said second resource response packet to said first node.

51. **(Currently amended)** The network element of claim 46, wherein said processor is **further** configured to

if a state of said virtual path is one of 'restoring' and 'deleting',  
copy said resource request packet to said first resource response packet,  
decrement said hop count field in said first resource response packet,  
add an error code of to said first resource response packet, and  
respond with said first resource response packet.

52. (Previously presented) The network element of claim 36, wherein  
said network element is configured as said second node, and  
said network element is configured to receive said resource request packet.

53. **(Currently amended)** The network element of claim 52, wherein said processor is **further** configured to

if said resource request packet includes invalid information,  
copy said resource request packet to a third resource response packet,  
decrement a hop count field in said third resource response packet,  
add an error code to said third resource response packet, and  
respond with said third resource response packet; and  
if said resource request packet includes valid information,  
determine if a resource is available for said virtual path.

54. **(Currently amended)** The network element of claim 53, wherein said processor is **further** configured to

if said resource is available for said virtual path,  
copy said resource request packet to said third resource response packet,  
allocate said resource to said virtual path,  
update said virtual path information in a node database,  
decrement a hop count field in said third resource response packet,  
add a list of a plurality of ports to said third resource response packet, and  
respond with said third resource response packet.

55. (Currently amended) The network element of claim 53, wherein said processor is **further** configured to

if said resource is not available for said virtual path,

copy said resource request packet to said third resource response packet,

decrement said hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet.

56. (Currently amended) The network element of claim 52, wherein said processor is **further** configured to

if a state of said virtual path is one of 'restoring' and 'deleting',

copy said resource request packet to said third resource response packet,

decrement said hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet.

57. (Currently amended) A computer system comprising:

means for identifying a plurality of nodes with resources, wherein said nodes with resources are comprised in an optical network and have a resource necessary to support a virtual path, said means for identifying said plurality of nodes with resources comprising

**means for, in response to detecting a failure in said virtual path, forwarding a resource request to an adjacent node,**

**means for waiting for a predefined time for a response to said resource request,**

**means for, if said response to said resource request is not received within said predefined time, initiating a subsequent failure measure, wherein**

**said subsequent failure measure comprises a network alarm, and**

means for receiving, from a candidate node, information indicating that said candidate node has sufficient resources available to support said virtual path, wherein

said candidate node is configured to determine whether said candidate node has sufficient resources available to support said virtual path; **and**

**~~said information is transmitted from said candidate node along a first physical path; and~~**

means for identifying, **based at least in part on said identifying said plurality of nodes with resources, said first physical path as** an alternate physical path **~~for said virtual path~~**, said alternate physical path comprising ones of said nodes with resources.

58. (Currently amended) The computer system of claim 57, **~~further~~** comprising:  
means for restoring said virtual path using said alternate physical path.

59. (Previously presented) The computer system of claim 57, wherein said means for restoring comprises:

means for configuring said alternate physical path by establishing a communication connection between said ones of said nodes with resources; and

means for provisioning said virtual path over said alternate physical path.

60. **(Currently amended)** The computer system of claim 58, ~~further~~ comprising:  
means for detecting ~~[[a]]~~ **said** failure in said virtual path; wherein  
said detection of said failure is done by receiving a failure message ~~packet~~;  
said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;  
said optical network comprises nodes, and said nodes comprise said nodes with  
resources;  
each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;  
said physical path between said first and said second node comprises a plurality of  
intermediate nodes; and  
each one of said nodes is coupled to at least one other of said nodes in a mesh topology.
61. (Original) The computer system of claim 60, wherein said restoring of said virtual path is  
completed in less than 2 seconds.
62. (Original) The computer system of claim 60, wherein said restoring of said virtual path is  
completed in less than 250 milliseconds.
63. **(Currently amended)** The computer system of claim 60, wherein said first node  
receives said failure message ~~packet~~.

64. **(Currently amended)** The computer system of claim 63, ~~further~~ comprising:
- (i) means for changing a state of said virtual path to restoring;
  - (ii) means for identifying an adjacent node with required bandwidth for said virtual path;
  - (iii) means for forwarding a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) means for waiting for a resource response packet for a predetermined time interval; and
- means for repeating actions of said means (ii) – (iv) for a predefined threshold time if said resource response packet is not received within said predetermined time interval.
65. **(Currently amended)** The computer system of claim 64, ~~further~~ comprising:
- means for generating a network alarm if said resource response packet is not received within said predefined threshold time.
66. **(Currently amended)** The computer system of claim 64, ~~further~~ comprising:
- means for waiting until responses to all resource request packets are received if said resource response packet is received with at least one error; and
- means for determining if a list of allocated ports in said resource response packet is valid if said resource response packet is received with no errors.
67. **(Currently amended)** The computer system of claim 66, ~~further~~ comprising:
- means for provisioning said virtual path on said allocated ports if said list of allocated port is valid; and
- means for generating a network alarm if said list of allocated ports is invalid.

68.    **(Currently amended)** The computer system of claim 66, ~~further~~ comprising:  
means for generating a network alarm if responses to all resource request packets are received with at least one error.
69.    (Previously presented) The computer system of claim 65, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.
70.    (Original) The computer system of claim 60, wherein one of said intermediate nodes receives said failure message.
71.    **(Currently amended)** The computer system of claim 70, ~~further~~ comprising:  
means for changing a state of said virtual path to down;  
means for forwarding said failure message to adjacent nodes comprising said virtual path;  
means for initiating a timer for receiving a response to said forwarded failure message;  
means for releasing resources of said virtual path if said timer expires before said response to said forwarded failure message is received;  
means for stopping said timer if said response to said forwarded failure message is received before said timer expires; and  
means for releasing resources of said virtual path if said response to said forwarded failure message is received before said timer expires.

72. (Original) The computer system of claim 60, wherein said second node receives said failure message.

73. (**Currently amended**) The computer system of claim 72, ~~further~~ comprising:

means for acknowledging said failure message;

means for changing a state of said virtual path to down; and

means for releasing resources of said virtual path.

74. (Original) The computer system of claim 64, wherein one of said intermediate nodes receives said resource request packet.

75. (**Currently amended**) The computer system of claim 74, ~~further~~ comprising:

means for copying said resource request packet to a first resource response packet if said resource request packet includes at least one error;

means for decrementing a hop count field in said first resource response packet if said resource request packet includes at least one error;

means for adding an error code to said first resource response packet if said resource request packet includes at least one error;

means for responding with said first resource response packet if said resource request packet includes at least one error;

means for allocating a resource to said virtual path if said resource request packet includes no errors;

means for incrementing a hop count field in said resource request packet if said resource request packet includes no errors;

means for forwarding said resource request packet to an adjacent node having a resource necessary to support said virtual path if said resource request packet includes no errors; and

means for waiting for a second resource response packet from said adjacent node if said resource request packet includes no errors.

76. **(Currently amended)** The computer system of claim 75, ~~further~~ comprising:
- means for releasing said resource allocated to said virtual path if said second resource response packet is not received within a second predetermined time interval; and
- means for forwarding a negative acknowledgment to said first node if said second resource response packet is not received within said second predetermined time interval.
77. **(Currently amended)** The computer system of claim 75, ~~further~~ comprising:
- means for releasing said resources allocated to said virtual path if said second resource response packet is received with at least one error;
- means for decrementing a hop count field in said second resource response packet if said second resource response packet is received with at least one error;
- means for forwarding said second resource response packet to said first node if said second resource response packet is received with at least one error; and
- means for determining if said second resource response packet includes a valid list of a plurality of ports if said second resource response packet is received with no errors.
78. **(Currently amended)** The computer system of claim 77, ~~further~~ comprising:
- means for releasing resources allocated to said virtual path if said list of said plurality of ports is invalid;
- means for forwarding a negative acknowledgement to said first node if said list of said plurality of ports is invalid;
- means for determining if said plurality of ports is available if said list of said plurality of ports is valid;

means for assigning said plurality of ports to said virtual path if said plurality of ports is available;

means for updating said virtual path information in a node database if said plurality of ports is available;

means for adding an error code to said second resource response packet if said plurality of ports is not available;

means for decrementing a hop count field in said second resource response packet; and

means for forwarding said second resource response packet to said first node.

79. **(Currently amended)** The computer system of claim 74, ~~further~~ comprising:

means for copying said resource request packet to said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for decrementing said hop count field in said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for adding an error code of to said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting'; and

means for responding with said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting'.

80. **(Original)** The computer system of claim 64, wherein said second node receives said resource request packet.

81. **(Currently amended)** The computer system of claim 80, ~~further~~ comprising:

means for copying said resource request packet to a third resource response packet if said resource request packet includes invalid information;

means for decrementing a hop count field in said third resource response packet if said resource request packet includes invalid information;

means for adding an error code to said third resource response packet if said resource request packet includes invalid information;

means for responding with said third resource response packet if said resource request packet includes invalid information; and

means for determining if a resource is available for said virtual path if said resource request packet includes valid information.

82. **(Currently amended)** The computer system of claim 81, ~~further~~ comprising:

means for copying said resource request packet to said third resource response packet if said resource is available for said virtual path;

means for allocating said resource to said virtual path if said resource is available for said virtual path;

means for updating said virtual path information in a node database if said resource is available for said virtual path;

means for decrementing a hop count field in said third resource response packet if said resource is available for said virtual path;

means for adding a list of a plurality of ports to said third resource response packet if said resource is available for said virtual path; and

means for responding with said third resource response packet.

83. **(Currently amended)** The computer system of claim 81, ~~further~~ comprising:

means for copying said resource request packet to said third resource response packet if said resource is not available for said virtual path;

means for decrementing said hop count field in said third resource response packet if said resource is not available for said virtual path;

means for adding an error code to said third resource response packet if said resource is not available for said virtual path; and

means for responding with said third resource response packet.

84. **(Currently amended)** The computer system of claim 80, ~~further~~ comprising:

means for copying said resource request packet to said third resource response packet if a state of said virtual path is one of ‘restoring’ and ‘deleting’;

means for decrementing said hop count field in said third resource response packet if a state of said virtual path is one of ‘restoring’ and ‘deleting’;

means for adding an error code to said third resource response packet if a state of said virtual path is one of ‘restoring’ and ‘deleting’; and

means for responding with said third resource response packet.

85. **(Currently amended)** A computer program product encoded in computer readable storage media, said program product comprising a set of instructions executable on a computer system, said set of instructions configured to cause said computer system to

receive, from a candidate node, an indication that said candidate node has sufficient resources available to support said virtual ~~path; path, and~~

identify, based at least in part on said indication, a plurality of nodes with resources, wherein

said candidate node is configured to, in response to detecting a failure in said virtual path, forward a resource request to an adjacent node,

said candidate node is configured to wait for a predefined time for a response to said resource request,

said candidate node is configured to, if said response to said resource request is not received within said predefined time, initiate a subsequent failure measure, wherein

said subsequent failure measure comprises a network alarm,

said candidate node is configured to determine whether said candidate node has  
said sufficient resources available to support said virtual path,

said nodes with resources are comprised in an optical network and have a  
resource necessary to support a virtual path; **and**

~~said indication is transmitted from said candidate node along a first physical  
path; and~~

identify, **based at least in part on identifying said plurality of nodes with resources,**

~~said first physical path as~~ an alternate physical path ~~for said virtual path,~~ said  
alternate physical path comprising ones of said nodes with resources.

86. **(Currently amended)** The computer program product of claim 85, wherein said set of  
instructions is **~~further~~** configured to

restore said virtual path using said alternate physical path.

87. **(Currently amended)** The computer program product of claim 85, wherein said set of  
instructions is **~~further~~** configured to

configure said alternate physical path by establishing a communication connection  
between said ones of said nodes with resources; and

provision said virtual path over said alternate physical path.

88. **(Currently amended)** The computer program product of claim 85, wherein said set of instructions is ~~further~~ configured to

detect ~~[[a]]~~ said failure in said virtual path; wherein

said detection of said failure is done by receiving a failure message ~~packet~~;

said virtual path is provisioned on a physical path between a first and a second node of said optical network;

said optical network comprises nodes, and said nodes comprise said nodes with resources;

each one of said nodes is coupled to at least one other of said nodes by a plurality of optical links;

said physical path between said first and said second node comprises a plurality of intermediate nodes; and

each one of said nodes is coupled to at least one other of said nodes in a mesh topology.

89. **(Currently amended)** The computer program product of claim 88, wherein said set of instructions is ~~further~~ configured to restore said virtual path in less than 2 seconds.

90. **(Currently amended)** The computer program product of claim 88, wherein said set of instructions is ~~further~~ configured to restore said virtual path in less than 250 milliseconds.

91. **(Currently amended)** The computer program product of claim 88, wherein said first node receives said failure message ~~packet~~.

92. **(Currently amended)** The computer program product of claim 91, wherein said set of instructions is **further** configured to

- (i) change a state of said virtual path to restoring;
- (ii) identify an adjacent node with required bandwidth for said virtual path;
- (iii) forward a resource request packet to said adjacent node with required bandwidth for said virtual path;
- (iv) wait for a resource response packet for a predetermined time interval; and
- (v) if said resource response packet is not received within said predetermined time interval, repeat steps (ii) – (iv) for a predefined threshold time.

93. **(Currently amended)** The computer program product of claim 92, wherein said set of instructions is **further** configured to

if said resource response packet is not received within said predefined threshold time,  
generate a network alarm.

94. **(Currently amended)** The computer program product of claim 92, wherein said set of instructions is **further** configured to

if said resource response packet is received with at least one error,  
wait until responses to all resource request packets are received; and  
if said resource response packet is received with no errors,  
determine if a list of allocated ports in said resource response packet is valid.

95. **(Currently amended)** The computer program product of claim 94, wherein said set of instructions is **further** configured to

if said list of allocated port is valid,

provision said virtual path on said allocated ports; and

if said list of allocated ports is invalid,

generate a network alarm.

96. **(Currently amended)** The computer program product of claim 93, wherein said set of instructions is **further** configured to

if responses to all resource request packets are received with at least one error,

generate a network alarm.

97. (Previously presented) The computer program product of claim 92, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.

98. (Original) The computer program product of claim 88, wherein one of said intermediate nodes receives said failure message.

99. **(Currently amended)** The computer program product of claim 88, wherein said set of instructions is **further** configured to

change a state of said virtual path to down;

forward said failure message to adjacent nodes comprising said virtual path;

initiate a timer for receiving a response to said forwarded failure message;

if said timer expires before said response to said forwarded failure message is received,

release resources of said virtual path; and

if said response to said forwarded failure message is received before said timer expires,

stop said timer, and  
release resources of said virtual path.

100. (Original) The computer program product of claim 88, wherein said second node receives said failure message.

101. (**Currently amended**) The computer program product of claim 100, wherein said set of instructions is ~~further~~ configured to

acknowledge said failure message;  
change a state of said virtual path to down; and  
release resources of said virtual path.

102. (Original) The computer program product of claim 92, wherein one of said intermediate nodes receives said resource request packet.

103. (**Currently amended**) The computer program product of claim 92, wherein said set of instructions is ~~further~~ configured to

if said resource request packet includes at least one error,  
copy said resource request packet to a first resource response packet,  
decrement a hop count field in said first resource response packet,  
add an error code to said first resource response packet, and  
respond with said first resource response packet; and  
if said resource request packet includes no errors,  
allocate a resource to said virtual path,  
increment a hop count field in said resource request packet,

forward said resource request packet to an adjacent node having a resource  
necessary to support said virtual path, and  
wait for a second resource response packet from said adjacent node.

104. **(Currently amended)** The computer program product of claim 103, wherein said set of instructions is **further** configured to

if said second resource response packet is not received within a second predetermined  
time interval,  
release said resource allocated to said virtual path, and  
forward a negative acknowledgment to said first node.

105. **(Currently amended)** The computer program product of claim 103, wherein said set of instructions is **further** configured to

if said second resource response packet is received with at least one error,  
release said resources allocated to said virtual path,  
decrement a hop count field in said second resource response packet, and  
forward said second resource response packet to said first node; and  
if said second resource response packet is received with no errors,  
determine if said second resource response packet includes a valid list of a  
plurality of ports.

106. **(Currently amended)** The computer program product of claim 105, wherein said set of instructions is **further** configured to

if said list of said plurality of ports is invalid,  
release resources allocated to said virtual path, and  
forward a negative acknowledgement to said first node;  
if said list of said plurality of ports is valid,

determine if said plurality of ports is available;  
if said plurality of ports is available,  
    assign said plurality of ports to said virtual path, and  
    update said virtual path information in a node database;  
if said plurality of ports is not available,  
    add an error code to said second resource response packet;  
decrement a hop count field in said second resource response packet; and  
forward said second resource response packet to said first node.

107. **(Currently amended)** The computer program product of claim 102, wherein said set of instructions is **further** configured to

    if a state of said virtual path is one of ‘restoring’ and ‘deleting’,  
        copy said resource request packet to said first resource response packet,  
        decrement said hop count field in said first resource response packet,  
        add an error code of to said first resource response packet, and  
        respond with said first resource response packet.

108. **(Original)** The computer program product of claim 92, wherein said second node receives said resource request packet.

109. **(Currently amended)** The computer program product of claim 108, wherein said set of instructions is **further** configured to

    if said resource request packet includes invalid information,  
        copy said resource request packet to a third resource response packet,  
        decrement a hop count field in said third resource response packet,  
        add an error code to said third resource response packet, and

respond with said third resource response packet; and  
if said resource request packet includes valid information,  
determine if a resource is available for said virtual path.

110. **(Currently amended)** The computer program product of claim 109, wherein said set of instructions is ~~further~~ configured to

if said resource is available for said virtual path,  
copy said resource request packet to said third resource response packet,  
allocate said resource to said virtual path,  
update said virtual path information in a node database,  
decrement a hop count field in said third resource response packet,  
add a list of a plurality of ports to said third resource response packet, and  
respond with said third resource response packet.

111. **(Currently amended)** The computer program product of claim 108, wherein said set of instructions is ~~further~~ configured to

if said resource is not available for said virtual path,  
copy said resource request packet to said third resource response packet,  
decrement said hop count field in said third resource response packet,  
add an error code to said third resource response packet, and  
respond with said third resource response packet.

112. **(Currently amended)** The computer program product of claim 108, wherein said set of instructions is **further** configured to

if a state of said virtual path is one of ‘restoring’ and ‘deleting’,

copy said resource request packet to said third resource response packet,

decrement said hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet.

113. **(Previously presented)** A network element configured to restore a virtual path in an optical network, said network element comprising:

a processor;

a memory coupled to said processor; and

a network interface coupled to said processor; said processor configured to

identify a plurality of nodes with resources, wherein said nodes with resources are comprised in said optical network and have a resource necessary to support said virtual path,

identify an alternate physical path, said alternate physical path comprising ones of said nodes with resources,

detect a failure in said virtual path,

change a state of said virtual path to restoring,

(i) identify an adjacent node with required bandwidth for said virtual path,

(ii) forward a resource request packet to said adjacent node with required bandwidth for said virtual path,

(iii) wait for a resource response packet for a predetermined time interval, and

if said resource response packet is not received within said predetermined time interval, repeat steps (i)–(iii) for a predefined threshold time;

wherein,

said detection of said failure is done by receiving a failure message packet;

said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;

said optical network comprises nodes, and said nodes comprise said nodes with  
resources;

each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;

said physical path between said first and said second node comprises a plurality of  
intermediate nodes;

each one of said nodes is coupled to at least one other of said nodes in a mesh topology;

said network element is configured as said first node; and

said network element is configured to receive said failure message packet.

114. (Previously presented) The method of claim 1, wherein said identifying said plurality of nodes with resources comprises determining whether a node under consideration would be appropriate for use in restoring said virtual path by virtue of having sufficient resources available to support a physical path to be used by said virtual path.

115. (Previously presented) The method of claim 114, wherein said resources comprise an available bandwidth.

116. (Previously presented) The method of claim 114, wherein said resources comprise an available port.

117. (Previously presented) The method of claim 114, wherein said resources comprise an available class of service.

118. (Canceled)

119. (Previously presented) The method of claim 1, wherein said identifying said plurality of nodes with resources comprises rejecting a candidate node if said candidate node does not have sufficient resources available to support said virtual path.

120-121. (Canceled)

122. (Canceled)

123. (Canceled)

124. (Previously presented) The computer system of claim 57, wherein said means for identifying a plurality of nodes with resources is comprised in said candidate node.

125-126. (Canceled)

127. (Previously presented) The method of claim 1, wherein said identifying said alternate physical path comprises:

identifying said alternate physical path based at least in part on a list of allocated ports received from said candidate node.

128. (Previously presented) The network element of claim 29, wherein said processor is configured to:

identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.

129. (Previously presented) The computer system of claim 57, wherein said means for identifying said alternate physical path is configured to identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.

130. (Previously presented) The computer program product of claim 85, wherein said set of instructions is configured to

identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.